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Mountain Pine Beetle Trend and Impact Study in Yellowstone National Park

by

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The following is an annual report on a study to measure the trend and impact of a mountain pine beetle, Dendroctonus ponderosae Hopkins, infestation in lodgepole pine in the extreme southwestern corner of Yellowstone National Park. These trend and impact data were collected in a 1-square-mile area on a yearly basis from the beginning of the outbreak until the present. 1/

The outbreak in the Park is part of a general infestation that started in low elevation stands on the Targhee National Forest, intensified and spread into stands at higher elevations, eventually reaching the Park in 1966. In the study area, tree killing increased from 1967 to 1969, with peak mortality occurring in 1969. A drastic reduction in mortality occurred in 1970 and again in 1971. The infestation is expected to decrease further in 1972.

In 1965, before the infestation reached the Park, there were 211.4 live lodgepole pine trees per acre. Subsequent depletion of the stand by the mountain pine beetle reduced the number of live trees to 156.2 per acre in 1971. Even though the infestation has almost concluded, 73.9 percent of the trees above 5 inches in diameter are still green. Few of the larger diameter trees remain, but there is an adequate number of smaller trees to perpetuate the lodgepole pine forest (Fig. 1). A summary of the green stand structure follows:

	Green Stems/Acre							
	Diameter Classes							
Year	6	8	10	12	14	16	>16	Total*
1965	79.8	62.7	39.8	17.0	8.0	2.1	2.0	211.4
1966	79.5	61.9	39.0	16.4	7.6	1.8	1.7	207.9
1967	79.5	61.1	37.9	15.1	6.4	1.5	1.3	202.8
1968	79.2	58.4	34.0	12.3	4.2	0.8	0.4	189.3
1969	77.1	50.3	23.4	8.1	2.2	0.5	0.3	161.9
1970	77.1	49.6	22.0	6.9	1.8	0.3	0.1	157.8
1971	77.1	49.1	21.4	6.7	1.6	0.2	0.1	156.2

*Numbers have been averaged in this table and vary slightly from those found in the statistics table.

During the past 6 years, 55.2 trees per acre were lost in the study area due to the mountain pine beetle. The cumulative mortality of approximately 35,000 trees in this 1-square-mile area gave the Forest the appearance of being mostly dead. However, less than 30 percent of the trees were killed. In a few years, there will be little red foliage remaining on the dead trees, and the lodgepole stands will regain their former appearance. A resumé of the mortality follows:

1/ See the 1970 report for a detailed description of the sampling methods.

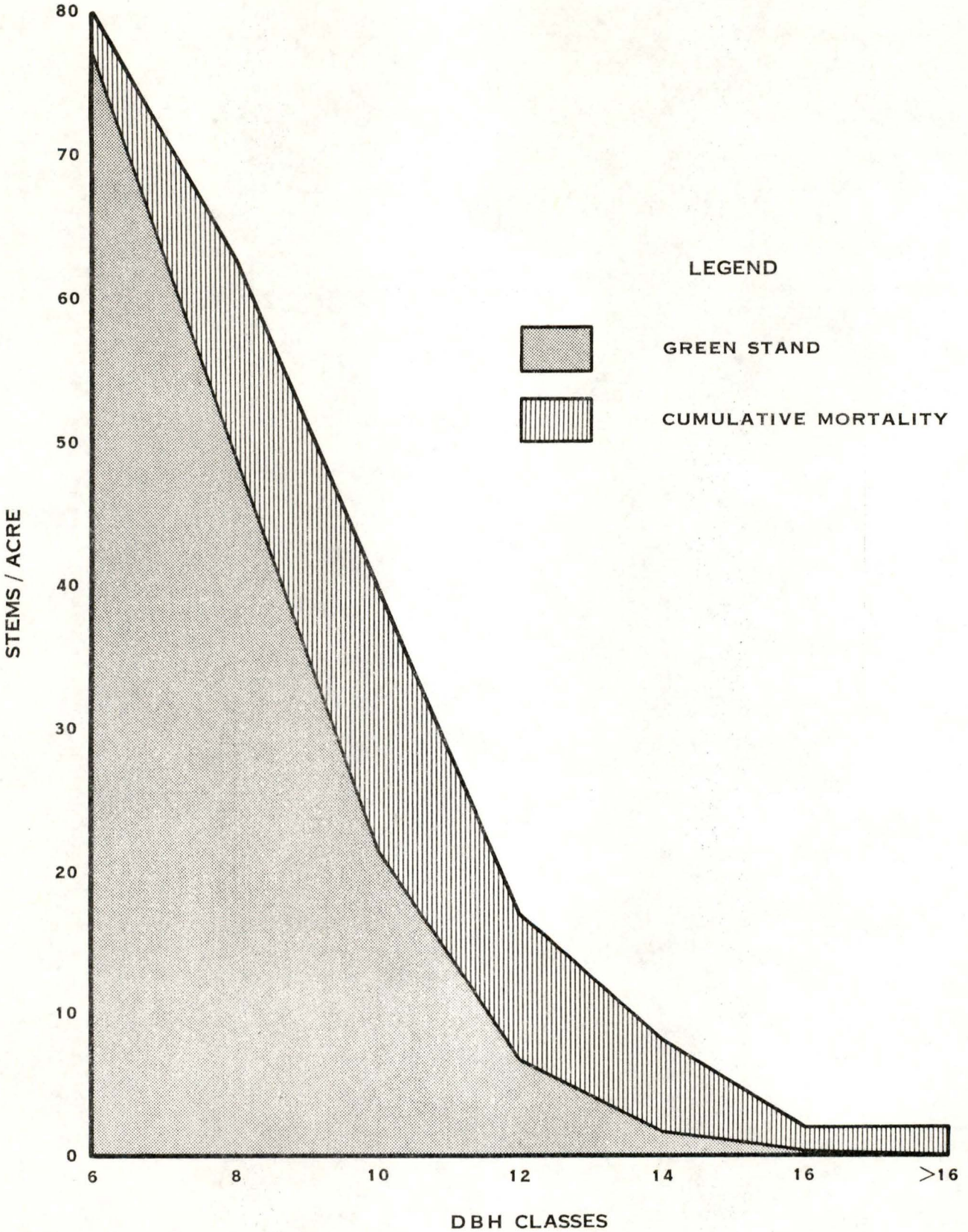

FIGURE 1. GRAPH SHOWING REMAINING GREEN STAND STRUCTURE AFTER SIX YEARS OF MOUNTAIN PINE BEETLE DEPREDRATIONS, YELLOWSTONE NATIONAL PARK, 1971

	Dead Stems/Acre*							
	Diameter Classes							
Year	6	8	10	12	14	16	> 16	Total
1966	0.3	0.8	0.8	0.6	0.4	0.3	0.3	3.5
1967	-	0.8	1.1	1.3	1.2	0.3	0.4	5.1
1968	0.3	2.7	3.9	2.8	2.2	0.7	0.9	13.5
1969	2.1	8.1	10.6	4.2	2.0	0.3	0.1	27.4
1970	-	0.7	1.4	1.2	0.4	0.2	0.2	4.1
1971	-	0.5	0.6	0.2	0.2	0.1	-	1.6
Total	2.7	13.6	18.4	10.3	6.4	1.9	1.9	55.2

*Some mortality counts have been changed. Methods used in computing the data and corrections in mortality predictions and sampling errors account for these changes.

A statistical analysis of between plot variation for the number of trees per acre follows:

Stand Condition Measured	Mean Per Plot	Standard Deviation	Standard Error	Coefficient of Variation (%)
Live	189.17	152.29	29.31	80.5
1966 mortality	3.61	8.70	0.94	241.0
1967 mortality	5.05	10.02	1.09	198.4
1968 mortality	13.43	18.06	1.96	134.5
1969 mortality	27.40	32.07	3.48	117.0
1970 mortality	4.04	8.75	0.95	216.6
1971 mortality	1.72	7.89	0.86	458.7

Data collected during this study have added greatly to the understanding of mountain pine beetle infestation trends, annual attrition, etc. However, the most important benefit has been in obtaining meaningful information for advising land managers. The survey data show that over 50 percent of the larger diameter trees have been lost during the outbreak. It is not difficult to realize the large amount of timber lost during such an epidemic. This would be an immense impact in an area managed primarily for timber production. However, in an area managed to preserve a natural environment, the loss of the larger trees could be considered beneficial. The mountain pine beetle is a consumer organism that feeds at the expense of some trees, but at the same time, provides for the ultimate survival of the lodgepole pine stands. It serves a function in the forest community by removing the larger trees and permitting nutrients to be recirculated to younger, more vigorous trees. Further, this study, in conjunction with other studies, has shown that the application of chemical suppression will not limit the overall loss. Trees temporarily saved through suppression actions will likely be killed by future infestations.

The mountain pine beetle cannot be eliminated from mature and overmature stands through man's efforts, unless most susceptible trees are killed or removed. Obviously, this is not a practical measure for a National Park.